

Section 6-1: Distance in the Coordinate Plane

By the end of this lesson, you should be able to answer:

- How do you use the distance formula to find the distance between two points?
- How do you use the midpoint formula?

Where you might see this in the real world:

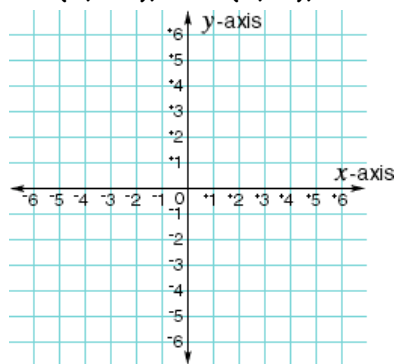
- Geography, market research, community service, architecture

Define the following terms:

1. Coordinate plane
2. Quadrants
3. x-axis
4. y-axis
5. Ordered pairs
6. Origin

We all know that the shortest distance from one point to another is a straight line. This is why it is so important that we are able to find the distance between two points. Sometimes it is easier to do than other times. It is actually quite easy to find the distance between two points if the segment they form is vertical or horizontal.

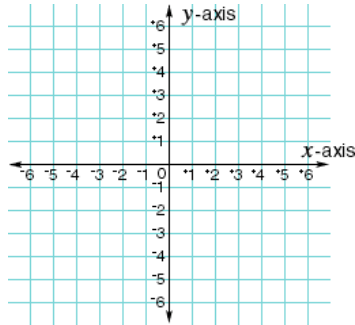
Example 1: The vertices of rectangle $ABCD$ are as follows: $A = (-2, -2)$, $B = (4, -2)$, $C = (4, 5)$, and $D = (-2, 5)$. Find the area of $ABCD$.



Here, in order to find the length of the sides, we use absolute value. For horizontal lines, just find the absolute value of the difference of the x-coordinates, and for a vertical line, find the absolute value of the y-coordinates.

This idea was originally used with finding the distance of two points that are not on a horizontal or vertical segment, along with the Pythagorean Theorem.

Example 2: Find the distance between the points $(0, 4)$ and $(4, 0)$.



Through this process, mathematicians realized they could use a formula to find the distance between any two points, now known as the distance formula. They also saw a pattern for when looking for the midpoint, which is like finding the “average” of the points.

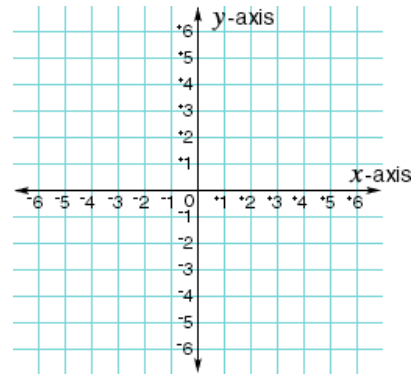
Distance Formula:

Midpoint Formula:

Example 3: The vertices of quadrilateral $ABCD$ are $A = (2, 4)$, $B = (-5, 2)$, $C = (-2, -1)$, and $D = (5, 1)$.

a. What kind of quadrilateral does $ABCD$ appear to be?

b. Use distances to justify your guess.



Homework:

"If I have seen further it is by standing on the shoulders of giants." - Isaac Newton